



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Vertical Accelerative Tower (VAT) Industry Day

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Meeting Agenda



| | | |
|------------|---|--------|
| 1030 -1100 | Introduction, Meeting Rules, Logistics, Etc | TARDEC |
| 1100 -1115 | Overview of Occupant Protection Testing | TARDEC |
| 1115 -1145 | Overview of VAT, building placement | TARDEC |
| 1145 -1230 | Lunch | All |
| 1230 -1415 | Q&A | All |
| 1415 | Adjourn | All |



Meeting Rules



- TARDEC will provide briefing covering Occupant Protection (OP) testing, VAT concept and the building the VAT is to be installed in
 - Attendees will hold all questions during this briefing
- The Q&A session will be conducted after lunch break
 - All questions will be recorded
 - If possible, an answer will be given immediately to any question asked
 - All questions and answers will be transferred to writing and posted on the Alion solicitation webpage
 - The Government may choose to defer answering any question until the written responses to questions are posted
- Written answers to questions supersede any information gathered during the face-to-face session
- One-on-One sessions with the Government will not be conducted



- Lunch will be 45 minutes (scheduled from 1130-1215)
 - There is an onsite Cafeteria & plenty of quick service restaurants in the area
- Male restrooms
 - Located out door and down hall on left
- Female restrooms
 - Located down hall, turn left at end of hallway, restrooms on left
- Cafeteria
 - Proceed past female restrooms
 - Turn right at T-intersection in front of Advanced Concepts Area
 - Turn left at next intersection, cafeteria located on the right



Mission



- Provides full life-cycle engineering support and is provider-of-first-choice for all DOD ground combat and combat support vehicle systems.
- Develops and integrates the right technology solutions to improve Current Force effectiveness and provide superior capabilities for the Future Force.

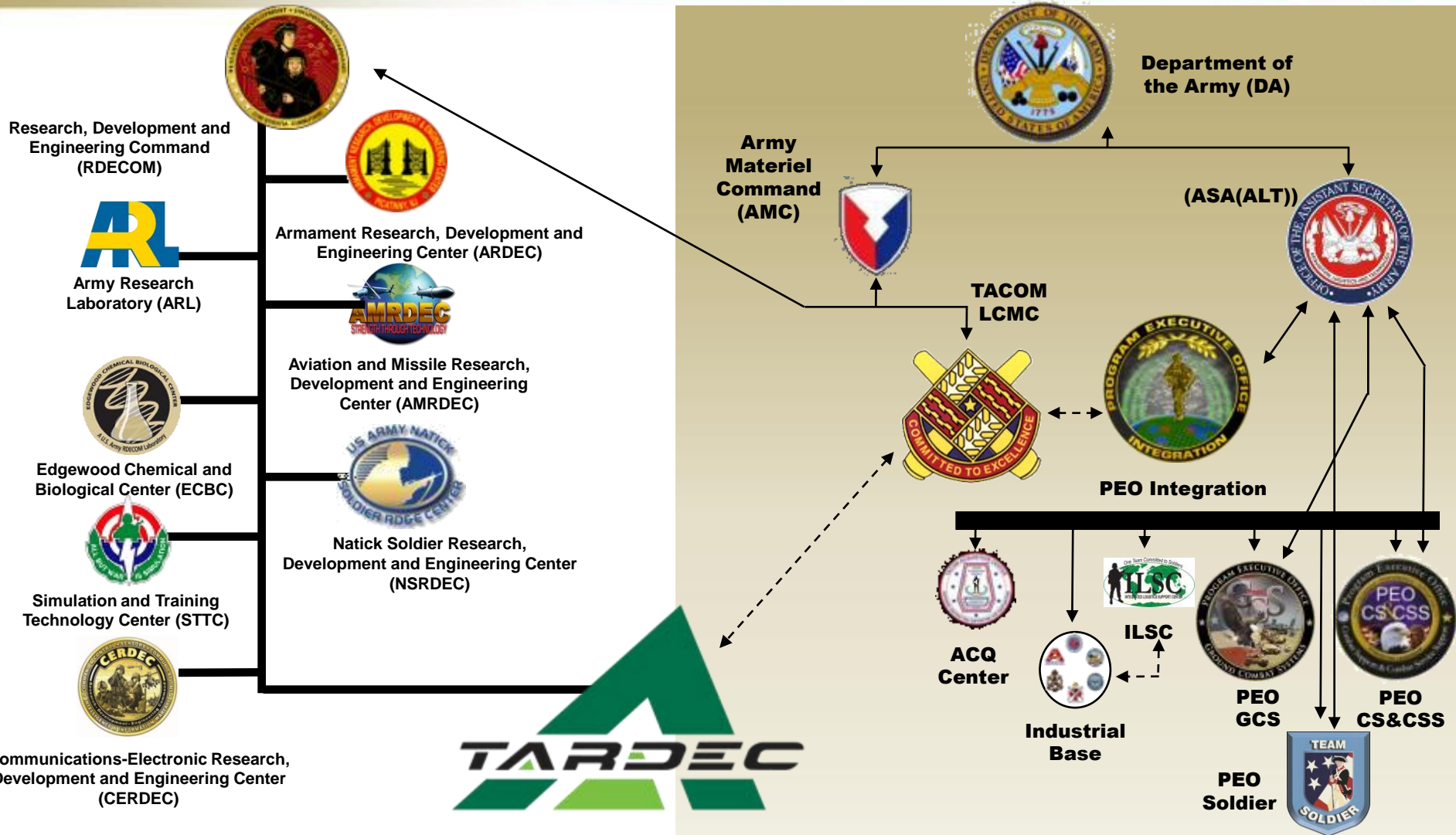
***Ground Systems Integrator
for the Department of Defense***



Responsible for Research, Development and Engineering Support to **2,800 Army systems and many of the Army's and DOD's Top Joint Warfighter Development Programs**

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Organizational Relationships



Reach back to over 8,500 Scientists and Engineers

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Combat Vehicles

- Heavy Brigade Combat Teams
- Strykers
- MRAPs
- Ground Combat Vehicles (Future)



Force Projection

- Fuel & Water Distribution
- Force Sustainment
- Construction Equipment
- Bridging
- Assured Mobility Systems



Tactical Vehicles

- HMMWVs
- Trailers
- Heavy, Medium and Light Tactical Vehicles



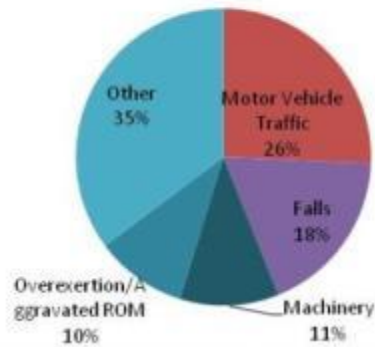
Robotics

- Technology Components
- Demonstrators
- Military Relevant Test & Experimentation
- Transition & Requirements Development

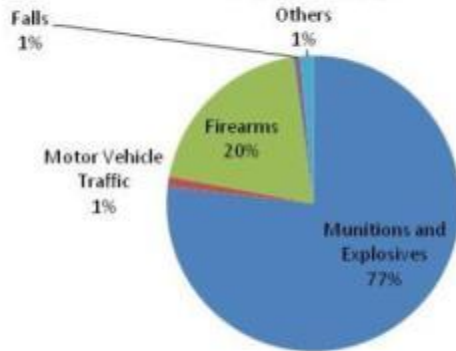
TARDEC Engineers Provide Cradle-To-Grave Engineering Support

What's the Issue?

**Cause Agent Breakdown (NBI)
2002-2008**

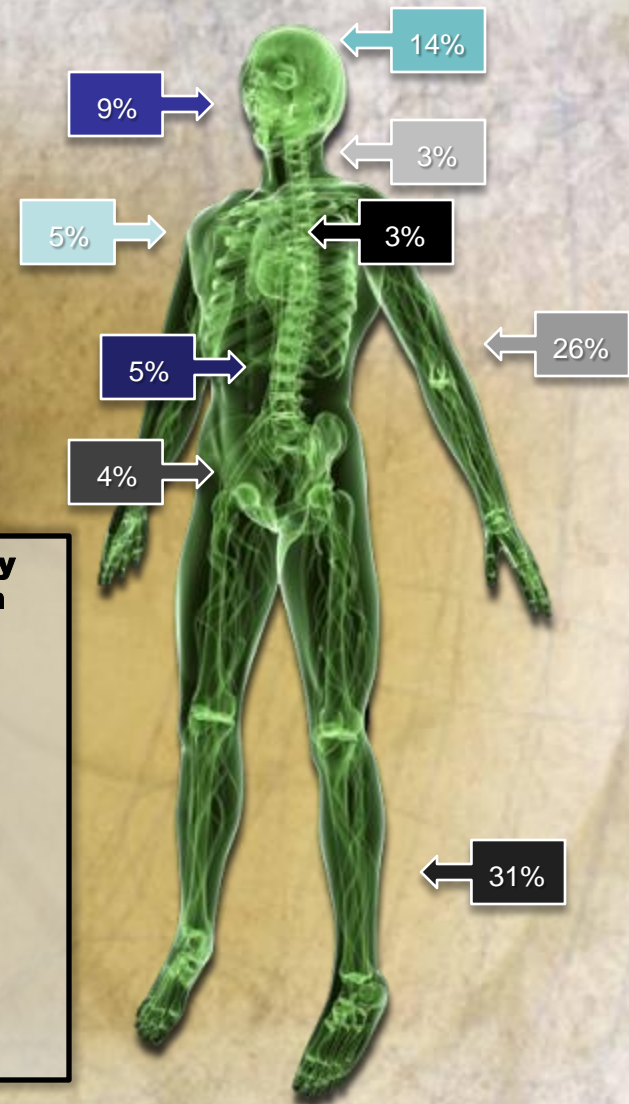


**Cause Agent Breakdown (BI)
2002-2008**



Percentage of Primary Injury by Body Region

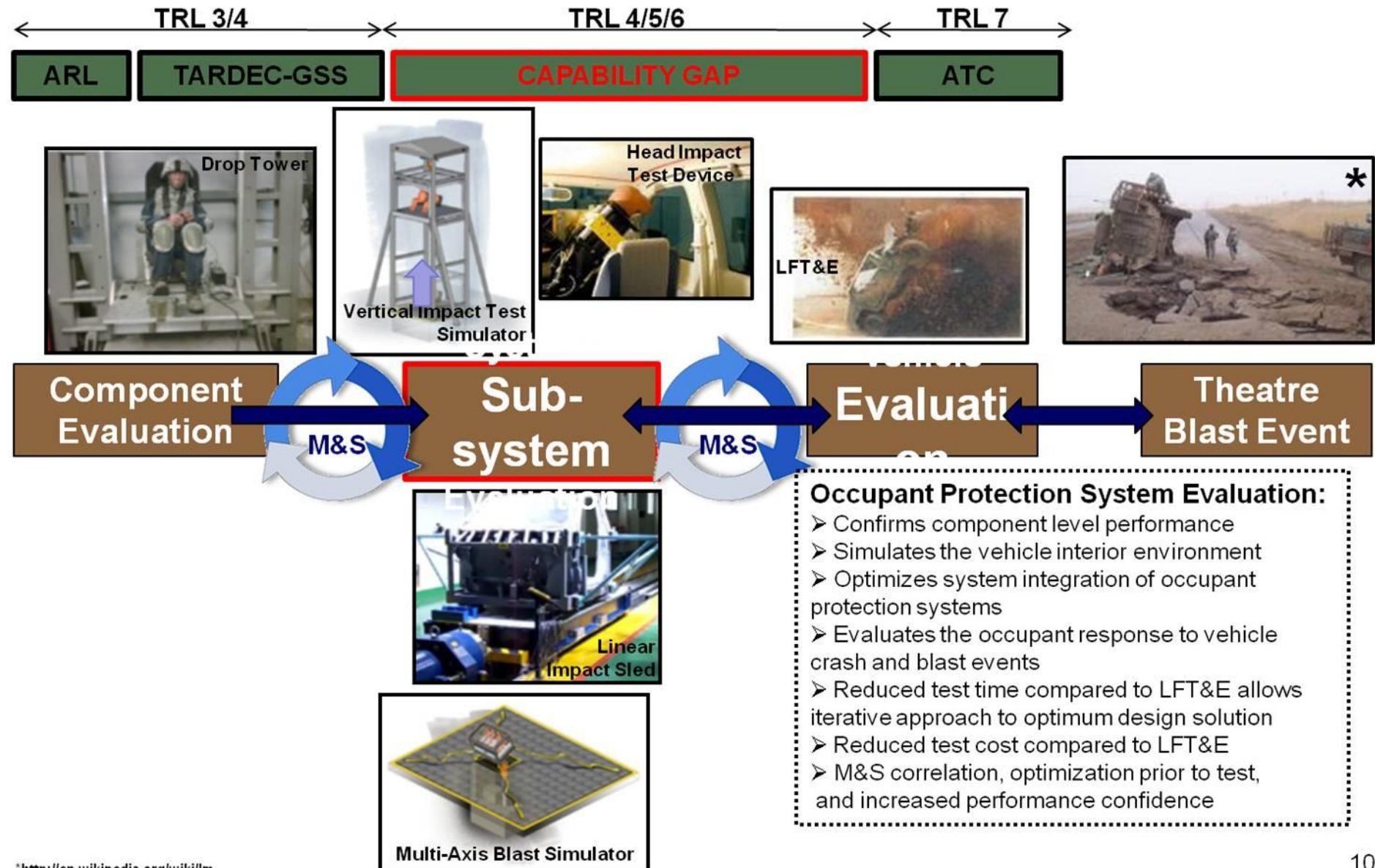
- Head
- Face
- Neck
- Spine
- Thorax
- Abdomen
- Pelvis
- Upper Extremity
- Lower Extremity



Life Cycle Management System CURRENT



Life Cycle Management System RECOMMENDED



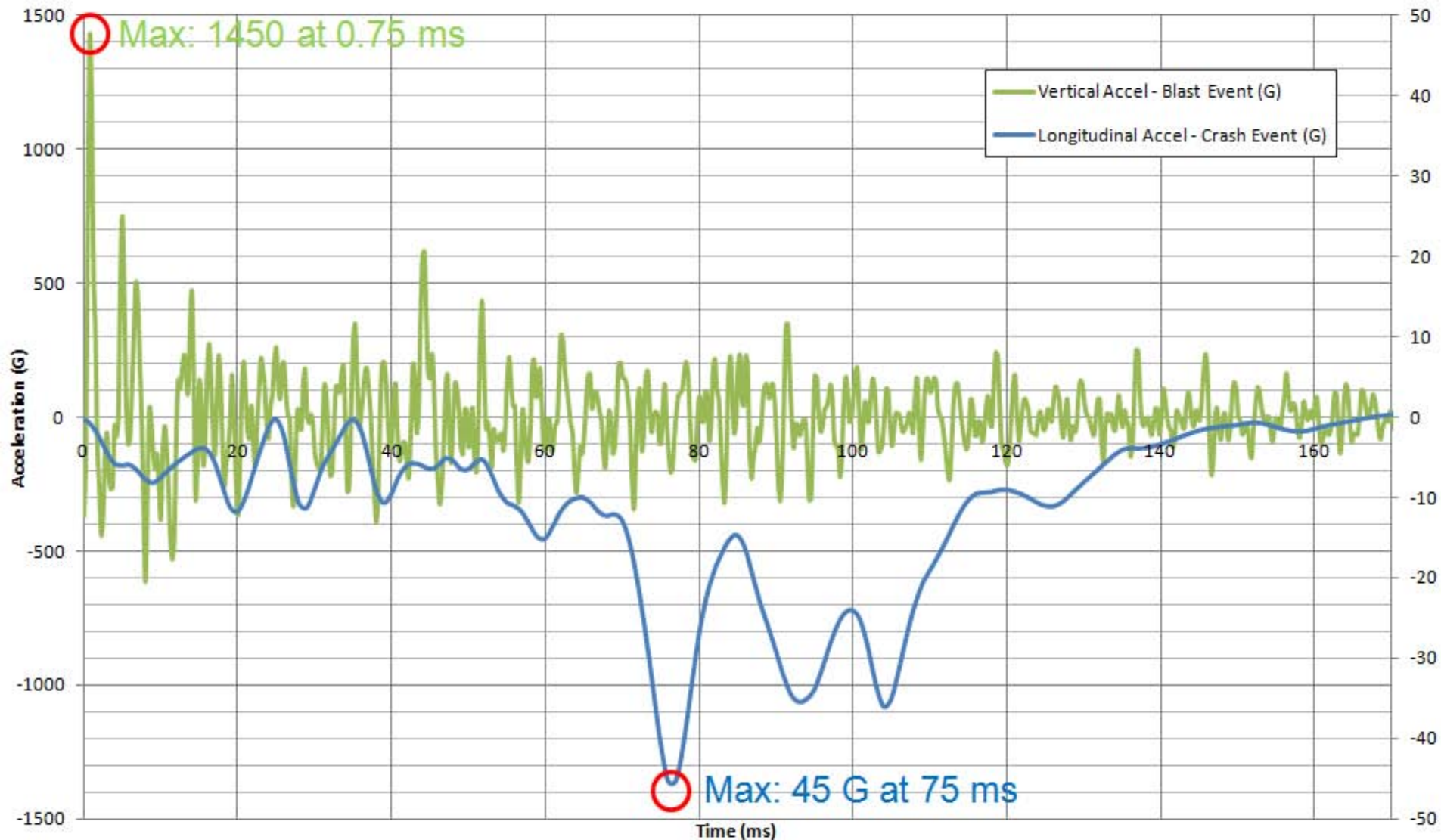
Underbody Blast Event



| High speed event | Typical Peak accelerations | Typical Time Duration Range (ms) |
|-----------------------------------|----------------------------|----------------------------------|
| Frontal Automotive Crash (30-mph) | 25 g to 50 g | 70 ms to 120 ms |
| Underbody Blast | 100 g to 400 g | 3 ms to 30 ms (primary) |

Peak Accelerations in underbody blast events are larger in magnitude and sooner than in typical automotive crash events

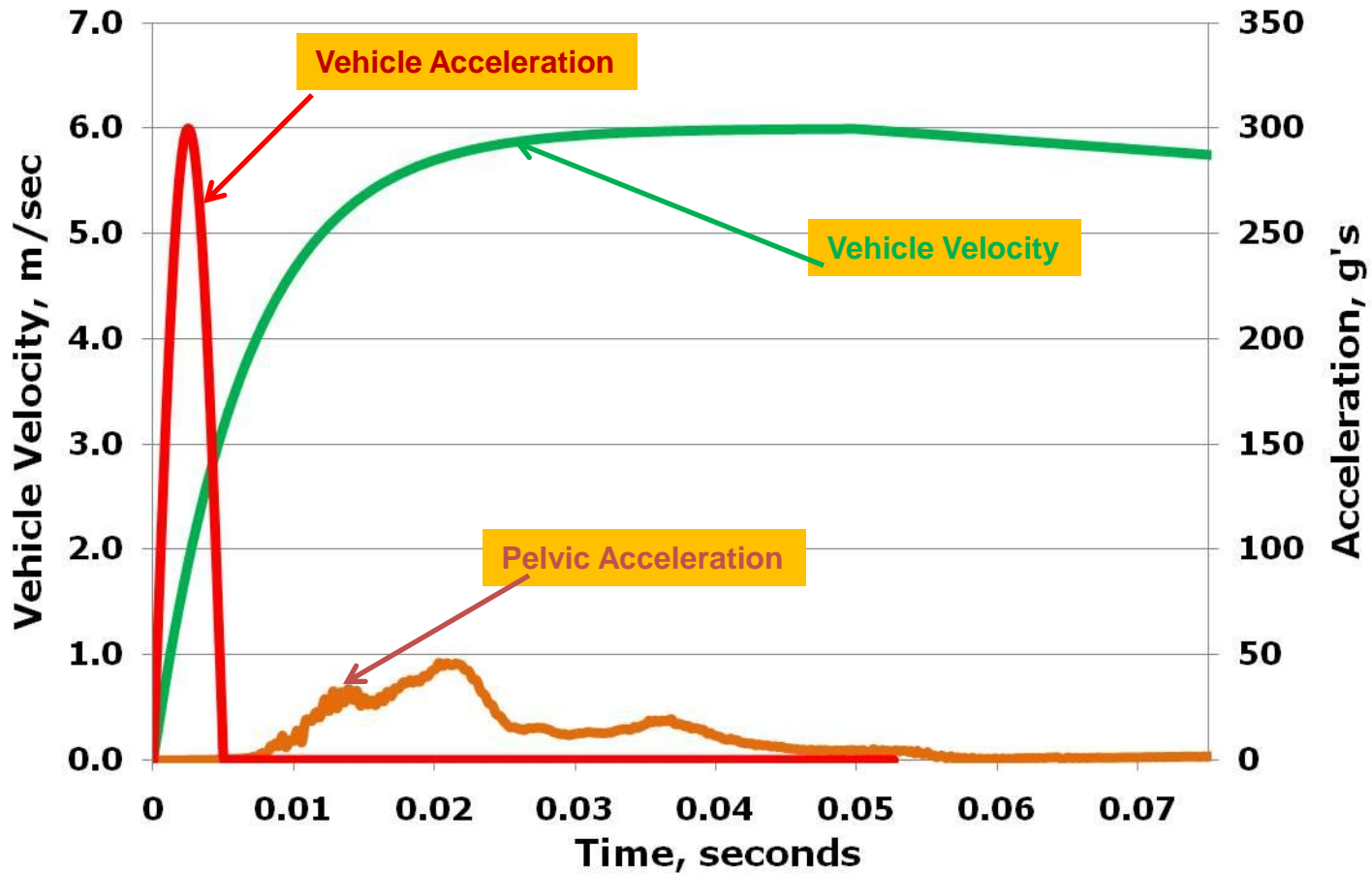
Blast vs. Crash Event Pulses



2010 Midsize Sedan– 40% offset crash data was obtained with permission from the Insurance Institute for Highway Safety

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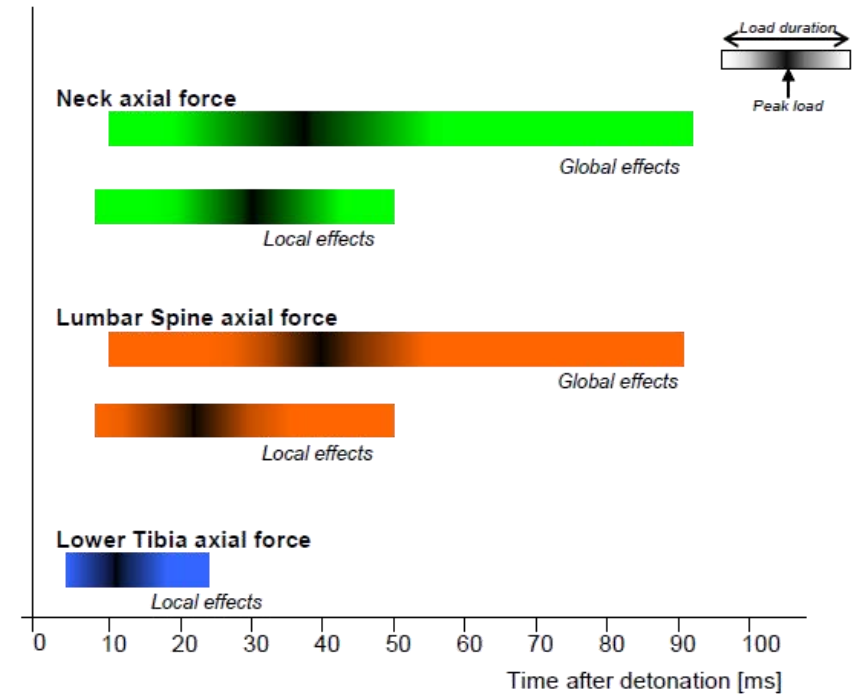
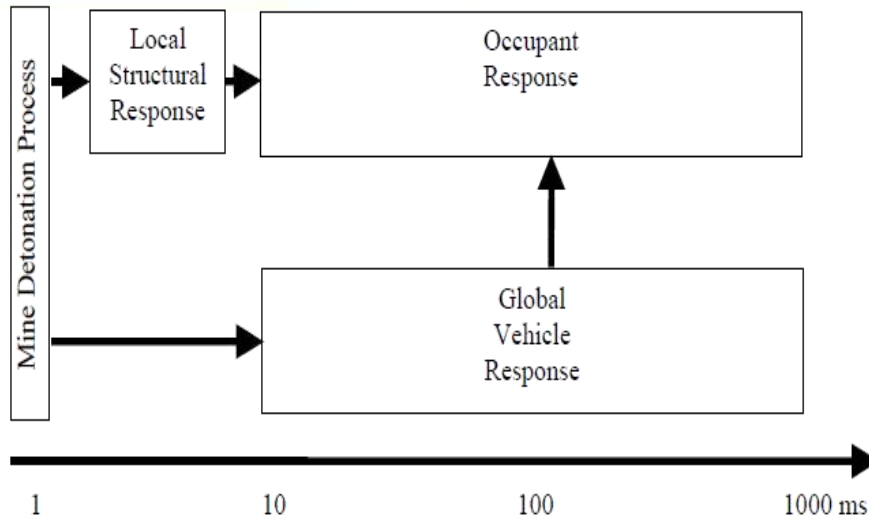
Underbody Blast Event Sequence



- ✓ Blast phase, lasts ~0.050 s
- ✓ Vehicle velocity builds up to constant peak value
- ✓ All key occupant injuries occur in this phase

- ✓ Gravity phase, lasts 1-2 s
- ✓ Vehicle Velocity reduces due to gravity, reaches peak upward displacement (liftoff), then drops down due to gravity (slam-down)

Underbody Blast Event Sequence



Source: NATO Research and Technology Organization Technical Report TR-HFM-090

Injuries in lower legs occur due to local structural effects in the first 10-15 msec, while Core spinal injuries occur due to global vehicle effects in the next 50 msec



Current Test Operations



- TARDEC Currently possesses a drop tower which it uses to conduct component level evaluations of occupant protection technologies
- The current drop tower is only capable of simulating a portion of the blast event
- It is difficult to predict the performance of the drop tower due to its design limitations



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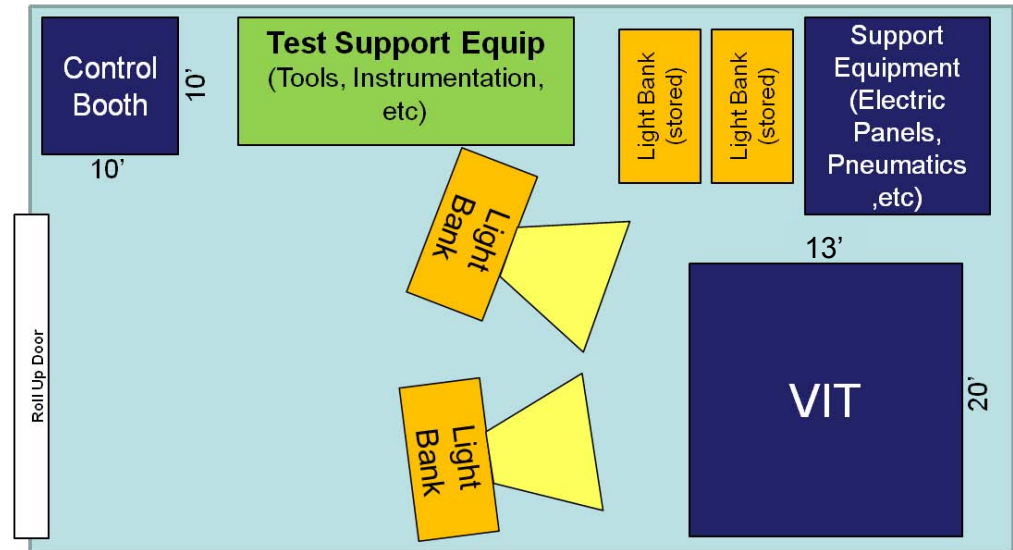
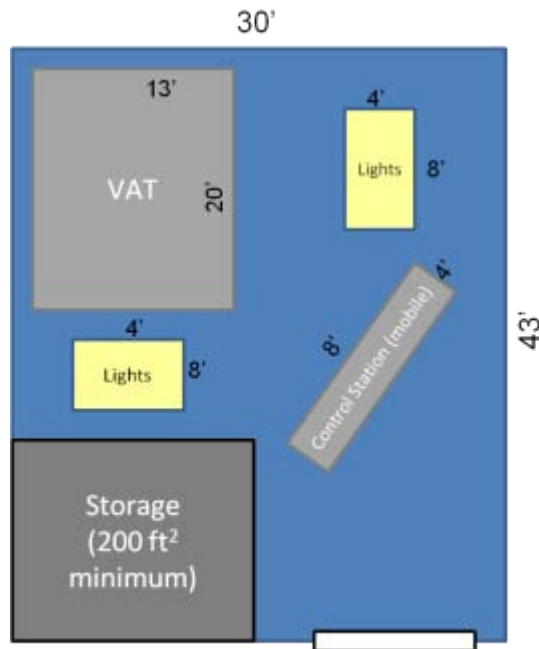
Vertical Accelerative Tower Concept

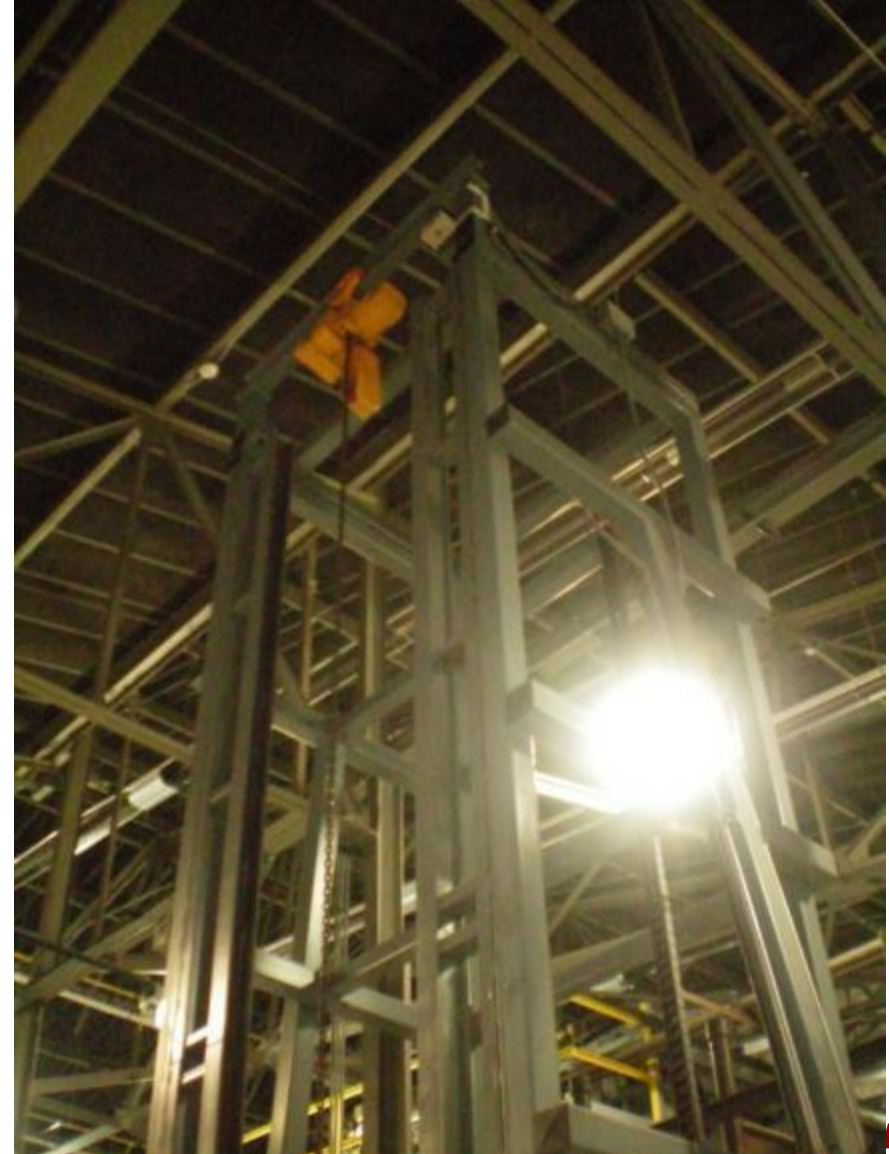


- The Vertical Accelerative Tower (VAT) will be designed to fill a portion of the capability gap between component and full vehicle testing
- The VAT shall be capable of simulating both the initial and “slam down” forces experienced by occupants of military vehicles that undergo underbody blast events
- The VAT shall be capable of testing four seat configuration (seats, seatbelts, active restraints/airbags) simultaneously
- The VAT shall be configurable to simulate the crew compartment of any current or future force military ground vehicle
- The VAT shall have a feature to “pre-load” the ATD feet to more accurately simulate an underbody blast event

VAT Placement

- The VAT will be constructed to fit within a 30' x 43' x 15' space in a building located at Selfridge Air National Guard Base in Chesterfield, MI









Lunch Break



Question & Answer Session



- State all questions clearly so they can be recorded
- The Government may choose to defer answering any question. All responses to questions will be provided in writing within five (5) business days following this session and posted on the Alion solicitation webpage
- Written answers to questions supersede any information gathered during this Q&A session
- One-on-One sessions with the Government will not be conducted



Budget Questions



- Is the current project funded and what is the budget authorization?
- Please confirm what is being asked to firm fix price with the initial proposal.
 - C.3.1 Detailed VAT System Design
 - C.3.2 Detailed Design of Supporting Equipment & Facility Requirements
 - C.3.3 Fabrication, Installation, Calibration, and Verification of VAT
- Is this different than the statement in the RFP instructions II.3 Contractors Technical and Cost Proposal shall be Broken out and subtotaled to address C.1, C.2, C.3 individually.
- Will budget estimates versus firm fixed price be accepted for the C.3.3 Fabrication, Installation, Calibration, and Verification of VAT?

The effort will be awarded as a Firm Fixed Price (FFP) by Task Order. Each Task must be individually priced out and subtotaled. Contractor proposals should reflect FFP. Questions regarding budget authorization should be directed to Alion Contracts.



Proposal Questions



- Will you be entertaining an extension in the proposal due date? It will be difficult to conceive a design and then estimate its cost in the requested proposal period.
- The RFP requires contractor to supply cameras (SOW C.3.1.1, section 4, c); Anthropomorphic Test Devices (ATD's) and required instrumentation (SOW C.3.1.1, section 4, d). Please clarify / verify that is correct.

The RFP closure date has been extended to 18 APR 11

The contractor is to provide a breakout of proposed costs to acquire and deliver the required VAT (Task 3). Based on the proposed cost to provide the required VAT, and the availability of funds, the Government may exercise the option to award Task 3.

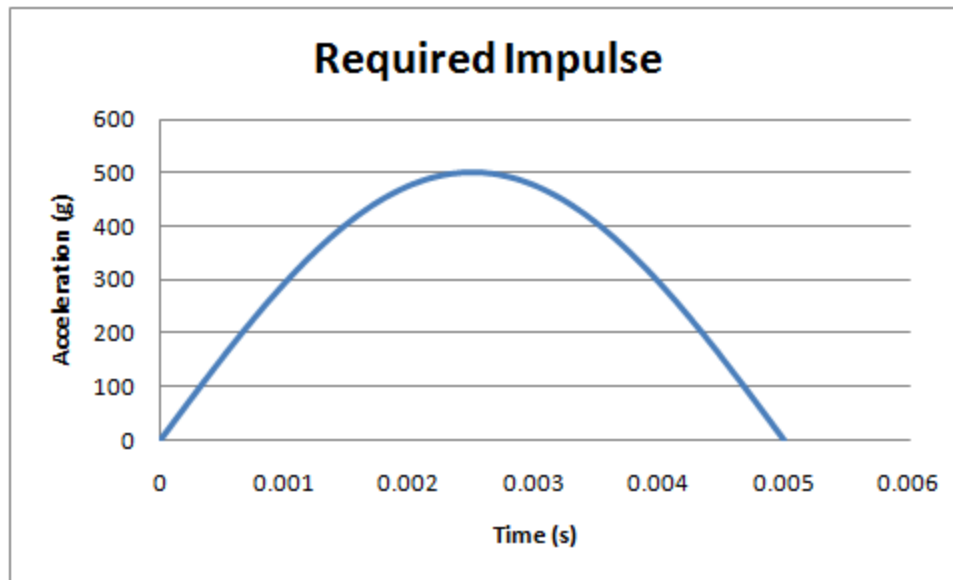
Competition Questions

- Is there an interested bidders list that can be shared with all competitors?
- We have received the technical report titled "OP SIL Concepts and feasibility Study (C.8.6.4.2)" generated by Badenoch LLC. Will Badenoch be allowed to bid on this procurement after they have prepared the reference concepts and feasibility study?

An interested bidder list will not be released for this contract

This procurement is Full & Open, therefore any company is eligible to bid.

- Please confirm the notation for the simulated half-sine pulse of 500 g - 5 ms. We take this to mean that over a time of 0.005 sec (=5 ms) the peak acceleration is to be 500 times the acceleration of gravity. The shape of this acceleration versus time is to be that of one-half of a sine wave, starting at zero g at time =zero, peaking at 500 g at time = 0.0025 sec, and diminishing to 0 g at time = 0.005 sec.





VAT Impulse Questions



- The SOW indicates that the VAT shall be capable of applying loads in the vertical, longitudinal, and lateral direction. Please define the forces to be applied in the longitudinal and lateral direction. Are these to be simultaneous with the application of the vertical force?
- SOW C.3.1.1, paragraph 1, b, iii on page 5. Please clarify this paragraph. Specifically:
 - Do the loads in the longitudinal and lateral directions need to be applied simultaneously and/or sequentially with the vertical load? Or, will these loads be applied separately?
 - If the latter, can these horizontal loads be applied on a separate machine as we have done at ARL?
 - Are the horizontal loads requirements the same as those specified for the vertical in section C.3.1.1, paragraph 1, a, viii?
- SOW C.3.1.1, paragraph 1, a, viii, are these loads are for the entire platform and fixture (global motion) or are the load requirements for the foot placement area introduced in C.3.1 getting mixed into these requirements?
 - What are the load requirements for the foot placement area?
 - What are the load requirements for the drop-down forces introduced in paragraph C.3.1?

The intent of applying off axis loading (i.e. horizontal/lateral loading) is that we have the capability to simulate underbody blasts that are not coming from directly below the vehicle. With this test fixture, we want to be able to simulate off center blasts (such as ones under one of the vehicle's wheel wells). These blast don't introduce pure vertical forces, there is an off-axis component to them. To this extent, the vertical and horizontal/lateral forces would need to be applied simultaneously/sequentially, and two separate test fixtures would not work. The load requirements are the same for both the vertical and horizontal/lateral directions.

The load requirements listed in C.3.1.1 para 1,a, viii are for the global motion of the test platform (i.e. these are the loads seen on the floor of the vehicle undergoing a blast event). The loading applied to the feet of the ATD would be similar in magnitude/time. Ideally, this would be tunable from test to test to achieve the exact input into the ATD feet that is being experienced in actual blast testing.



VAT Impulse Questions



- The SOW states that that the "VAT ... does not use any type of explosive material in the generation of the desired pulse". Does this restriction also exclude the use of explosive bolts or other pyrotechnic initiators?

Yes. No explosives of any type are to be used in the operation of the VAT.



VAT Impulse Questions



- Is there a limit on the deceleration rate and distance traveled to arrest the test article/sled after reaching the desired acceleration profile?

The VAT is to be designed to simulate the full underbody explosive event on a vehicle. This is to include the initial explosive reaction, which launches the vehicle into the air (the upward acceleration) and the “slam down” of the vehicle as it returns to the earth. The vehicle slam down is dependent on the properties of the vehicle, therefore, for the VAT, the deceleration rate and acceleration load is to be designed to be tunable to achieve the different profiles.



VAT Height Requirements



- SOW C.3.1.1, paragraph 1, a, iii, is there any flexibility regarding the specified height limitation of 15'
- The SOW indicates that the VAT shall fit within a space no bigger than 30' by 43' by 15' in height. The concept study looked at a drop tower much higher than the 15' requirement plus a 10 foot deep inertial mass foundation. Please confirm that the maximum height of the VAT should not exceed 15' above finished floor. What type of foundations are to be assumed/allowed or are we to design a foundation?

The building slated for installation of the VAT has 15' ceilings. Therefore the height requirement of the VAT is 15'. The study provided is to only be used as a reference to work that has already been done on the development of the VAT, not as a design specification.

The floor of the building in which the VAT is to be installed is standard concrete flooring. Bidders are to design the foundation for the VAT, to include seismic masses.



Backup











